ABSTRACT

A measurement device is provided that determines fluid properties from vibration frequencies of a sample cavity. In one embodiment, the measurement device includes a sample flow tube, vibration source and detector mounted on the tube, and a measurement module. The sample flow tube receives a flow of sample fluid for characterization. The measurement module employs the vibration sources to generate vibrations in the tube. The measurement module combines the signals from the vibration detector on the tube to determine properties of the sample fluid, such as density, viscosity, compressibility, water fraction, and bubble size. The measurement module may further detect certain flow patterns such as slug flow, for example. To measure the sample fluid density, the measurement module determines the resonant frequency of the sample flow tube. The density can then be calculated according to a formula that compensates for the temperature and pressure of the system.